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Editorial Review: Nano-frontrunners; implications

Abstract

It is expected that nanomarket will increase to about \$3.7 trillion in 2015 (Research and Markets, Dublin 2008). The sales for 2008 could be as high as \$200 billion according to the same Research Markets Dublin 2008. As a result of this potential in nanoscience and nanotechnology; every academia, country or government institution and private sector wants to be part of the race. Like any race; results are important as a measure of success and learning process for those that are not winning or that want to be included. Patent is very crucial as a measure of success by countries involved.

Keywords: Global nano, nanoprogress, nanopatent, ranking

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Gold Nanoparticles Conjugated with Folic Acid using Mercaptohexanol as the Linker

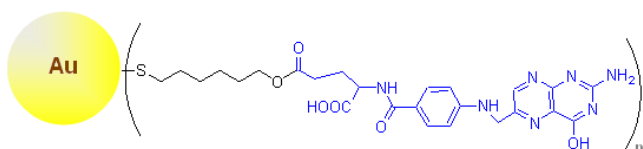
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Abstract

Nano-conjugation (also known as nano-coupling) is one of the important procedures to build nanotechnology platforms. We have designed a new nano-conjugate made of folic acid and gold nanoparticle (AuNP). This nano-conjugate has application for selective targeting of the folate receptor that is overexpressed on the surface of tumor cells. For this purpose, we conjugated 6-mercapto-1-hexanol, as a bifunctional linker, to folic acid through its (-OH) group with a (-O-CO-) linkage formation. Then, we made new (-SH) terminated product to react with H_{Au}Cl₄ in the presence of sodium borohydride and it was bound to the AuNP surface through its thiol group.



Finally, we evaluated the specific interaction between the folic acid and AuNP by the corresponding observed characteristic bands in the ultraviolet-visible (UV-vis) and Fourier transform infrared spectroscopy (FTIR) spectra. Transmission electron microscopic (TEM) images reveal the spherical AuNPs formation induced by the bifunctional linker. For such a new synthesized nanoconjugate, metallic pseudo-cubic structure ($\alpha=\beta=\gamma=90^\circ$) with lattice constants of $a=1.348$ nm, $b=1.348$ nm, and $c=0.725$ nm and (110), (011), (221), (321), (060), and (004) crystal planes were confirmed through powder X-ray diffraction. We estimated the average size of the conjugated nanoparticles to be about 3 nm by TEM. The Elemental analysis and atomic absorption showed around 70 % organic molecules on the surface of AuNPs. The procedure presented in this report may be applied to a variety of conjugations of interest in nanoscience and nanotechnology.

Keywords: 6-mercapto-1-hexano, Cancer Cell Targeting, Conjugated Nanoparticle, Folate, Folate Receptor, Folic Acid, Gold Nanoparticle, Nano-Conjugation, Nanotechnology

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Study of the Relationship between Nanoparticles of Silica and Thermoplastic Polymer (TPU) in Nanocomposites

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Abstract

Nanosilicas with different silanol contents were obtained by treatment of hydrophilic fumed silica with dimethyldichlorosilane. This treatment reduced the silanol content and produced the particle agglomeration of the nanosilicas. Thermoplastic polyurethane (TPU) adhesives containing nanosilicas were prepared and characterized by FTIR spectroscopy, differential scanning calorimetry (DSC), plate–plate rheology, dynamic mechanical thermal analysis (DMTA) and transmission electron microscopy (TEM). It was demonstrated that addition of hydrophilic nanosilicas favored the degree of phase separation between the hard (i.e. isocyanate + chain extender) and soft (i.e. polyol) segments in the TPUs; the higher the silanol content on the surface of silica, the higher the degree of phase separation, and the crystallinity of the polyurethane (due to the soft segments) was also increased. Hydrogen bonds between the ester carbonyl groups in the TPU and the silanol groups on the silica surface were created and more favored by increasing the silanol content.

Keywords: silica, nanosilica, polyurethane, nanocomposites, and nanoparticle.

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Single-cycle- infection Viral Vectors as Model Probes for Antiviral Screening, Potential Application in Nanomedicine

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Abstract

Alternative screening for nanomedicines applications, especially in the search for novel antiviral agents is very dire. Due to salient problems related with safety, speed, flexibility and cost associated with traditional antiviral screening techniques, alternative screening methods devoid of these limitations are constantly being sought for. Our approach has been largely based on the use of recombinant viral vectors expressing various reporter genes that could be diversely engineered to mimic the wild type parental virus as much as is required. To guarantee safety, the viral vectors are also engineered to undergo only a single replicating cycle. Using such recombinant single-cycle-infection viral vectors based on lentiviruses, retroviruses and adenoviruses as model probes, we have screened several medicinal plants for anti-HIV and anti-adenoviral properties.

Keywords: Viral vectors, probes, anti-HIV

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